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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER

YAMNITZKY, MARIE ROSE

ART UNIT	PAPER NUMBER
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1774

DATE MAILED: 09/13/2002

4

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/845,356

Applicant(s)

MISHIMA, MASAYUKI

Examiner

Marie R. Yamnitzky

Art Unit

1774

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 05/01/01, 07/16/01 and 02/04/02.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-15 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-15 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 2.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

Art Unit: 1774

1. Claims 1-15 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The term “kinds” as recited in claims 1, 2 and 10 renders the claims indefinite. It is not clear if “different kinds of light-emitting materials” has the same meaning as “different light-emitting materials” or if the requirement for different “kinds” of light-emitting materials is more restrictive. For example, an unsubstituted tris(2-phenylpyridine) iridium complex and a substituted tris(2-phenylpyridine) iridium complex having one or more substituents on the 2-phenylpyridine ligands are different light-emitting materials but it is not clear if they would meet the limitation of different “kinds” of light-emitting materials.

The limitations imposed by the term “main” in the phrase “a main component” as recited in claim 4 are not clear. It is not clear if this language places a specific limitation on the minimum amount of light-emitting material that must be present in the non-doped light-emitting layer and, if so, if the minimum amount is determined by weight, volume or moles.

The term “derivatives” as recited numerous times in claims 7 and 8 renders the claims indefinite. The scope of the various derivatives set forth in claims 7 and 8 is not clear.

The term “high” is relative. The scope of “electrically conductive high molecular oligomers” as recited in claim 8 is not clear. It is not clear if the term “high” places any particular limitation on the number of repeating units or the molecular weight of the oligomer.

Claim 8 includes a Markush group within a Markush group. It is not clear what the second Markush group (“selected from the group consisting of poly(N-vinylcarbazole)...and

Art Unit: 1774

polyfluorene derivatives”) pertains to. If the second Markush group is limiting the electrically conductive high molecular oligomers, the examiner suggests amending line 21 by inserting --and-- before “electrically” and deleting the comma after “oligomers”.

The scope of a styrylbenzene “derivative” and a pyran “derivative” as required by claim 11 is not clear.

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in-

(1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effect under this subsection of a national application published under section 122(b) only if the international application designating the United States was published under Article 21(2)(a) of such treaty in the English language; or

(2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that a patent shall not be deemed filed in the United States for the purposes of this subsection based on the filing of an international application filed under the treaty defined in section 351(a).

3. Claims 1, 2, 4-8 and 12-15 are rejected under 35 U.S.C. 102(b) as being anticipated by Baldo et al. in *Appl. Phys. Lett.* 75(1), pp. 4-6 (July 5, 1999).

See the whole reference.

Baldo et al. disclose light-emitting devices comprising a glass substrate, an anode, an organic compound layer including a light-emitting layer containing two light emitting materials, and a cathode. In various devices, the light-emitting layer contains *fac* tris(2-phenylpyridine)

Art Unit: 1774

iridium (abbreviated Ir(ppy)₃), which is an orthometallated complex of iridium that emits green light, and 4,4'-N,N'-dicarbazole-biphenyl (abbreviated CBP), which is a blue emissive material. Baldo et al. also disclose a device in which the light-emitting contains Ir(ppy)₃ and tris-(8-hydroxyquinoline) aluminum (abbreviated Alq₃).

Each of the prior art devices having a light-emitting layer comprising Ir(ppy)₃ in CBP or Ir(ppy)₃ in Alq₃ contains the Ir(ppy)₃ in an amount within the scope of claim 6.

Alq₃ meets the limitation of the at least one compound required by claim 7 and the host material required by claim 8 presuming at least "metal or rare earth complexes of 8-quinolinol derivatives" as recited in claim 7 and "metal complexes of 8-quinolinol derivatives" as recited in claim 8 encompass an aluminum complex of 8-hydroxyquinoline.

CBP meets the limitation of the host material required by claim 8 presuming at least "carbazole derivatives" and/or "arylamine derivatives" and/or "aromatic tertiary amine derivatives" encompass 4,4'-N,N'-dicarbazole-biphenyl. CBP also meets the limitations of the at least one compound required by claim 7 if at least "polyphenyl derivatives" encompass 4,4'-N,N'-dicarbazole-biphenyl.

The prior art devices having the layer structure depicted in Fig. 1 have an organic compound layer having a total thickness within the range set forth in claim 13 (860 Å = 0.086 μm). The prior art device having a layer structure similar to that depicted in Fig. 1 but without a BCP barrier layer also has an organic compound layer having a total thickness (800 Å) within the range set forth in claim 13.

With respect to the process limitations recited in claims 14 and 15, product-by-process claims are not limited to the method steps recited in the claims, only to the structure implied by the steps. In the present case, the only structure implied by the steps recited in claims 14 and 15 is a layer, and the prior art anticipates that structure.

4. Claims 1-8, 10 and 12-15 are rejected under 35 U.S.C. 102(e) as being anticipated by Forrest et al. (US 6,310,360 B1).

See the entire patent. In particular, see Fig. 1, Fig. 3, column 9, line 1 - c. 11, l. 60, c. 12, l. 58 - c. 13, l. 50, c. 14, l. 63 - c. 15, l. 17 and c. 17, l. 9 - c. 19, l. 19. Note that c. 11, l. 57 contains an error in that λ for Ir(ppy)₃ should read --~500 nm-- rather than “~400 nm”.

Forrest et al. disclose light-emitting devices comprising a glass substrate, an anode, an organic compound layer including a light-emitting layer/zone containing three light emitting materials, and a cathode. In Forrest's Example 1, the light-emitting layer consists of an alternating series of layers of CBP doped with Ir(ppy)₃ and CBP doped with DCM2.

“CBP” stands for 4,4'-N,N'-dicarbazole-biphenyl which is a blue light-emitting material having a light-emitting wavelength peak of about 400 nm.

“Ir(ppy)₃” stands for *fac* tris(2-phenylpyridine) iridium, which is a green light-emitting orthometallated complex of iridium having a light-emitting wavelength peak of about 500 nm.

“DCM2” is the abbreviation for a pyran compound that is a red light-emitting compound having a light-emitting wavelength peak of about 590 nm (the full name is given at c. 4, l. 56-58 and the formula is shown at the bottom of c. 9).

The device of prior art Example 1 is considered to meet the limitations of claim 2 because each of the layers of CBP doped with Ir(ppy)₃ and CBP doped with DCM2 is a layer containing two different light-emitting materials (CBP and either Ir(ppy)₃ or DCM2).

The device of prior art Example 1 is also considered to meet the limitations of claim 3 because Ir(ppy)₃ and DCM2 are two different light-emitting materials that are contained in different layers.

In the device of prior art Example 1, each of the layers of CBP doped with Ir(ppy)₃ contains Ir(ppy)₃ in an amount within the scope of claim 6.

CBP meets the limitation of the host material required by claim 8 presuming at least "carbazole derivatives" and/or "arylamine derivatives" and/or "aromatic tertiary amine derivatives" encompass 4,4'-N,N'-dicarbazole-biphenyl. CBP also meets the limitations of the at least one compound required by claim 7 if at least "polyphenyl derivatives" encompass 4,4'-N,N'-dicarbazole-biphenyl.

DCM2 meets the limitation of the at least one compound required by claim 7 presuming at least "pyran derivatives" encompass the pyran compound of the formula shown in c. 9 of the patent. The examiner notes that based on the formula shown in c. 9, DCM2 can be considered to be within the scope of "styrylamine derivatives" as recited in claim 7 and at least "arylamine derivatives" and "styrylamine compounds" as recited in claim 8, subject to clarification of the language of these claims.

The prior art device of Example 1 has an organic compound layer having a total thickness within the range set forth in claim 13 (1200 Å = 0.12 μm).

With respect to the process limitations recited in claims 14 and 15, product-by-process claims are not limited to the method steps recited in the claims, only to the structure implied by the steps. In the present case, the only structure implied by the steps recited in claims 14 and 15 is a layer, and the prior art anticipates that structure.

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims 1-15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Baldo et al. as applied under 35 U.S.C. 102(b) above or Forrest et al. as applied under 35 U.S.C. 102(e) above, either reference in further view of Egusa et al. (US 5,294,810).

Baldo et al. do not disclose a device comprising at least two different light-emitting layers as required by claim 3, do not disclose a device emitting white light as required by claim 9, do not disclose the combination of light-emitting materials as required by claim 10 and by claim 11, do not disclose all of the numerous materials within the scope of claim 7 and within the scope of claim 8, and do not disclose all of the transparent substrates within the scope of claim 12.

Forrest et al. do not disclose a device emitting white light as required by claim 9, do not disclose the combination of light-emitting materials as required by claim 11, do not disclose all

of the numerous materials within the scope of claim 7 and within the scope of claim 8, and do not disclose all of the transparent substrates within the scope of claim 12.

It was known in the art at the time of the invention that the color of light emitted by a light-emitting device can be controlled by the selection of light-emitting materials used in the device, and that emission of white light can be achieved by providing an appropriate combination of light-emitting materials.

Egusa et al. disclose light-emitting devices, teach that a light-emitting device may comprise more than one light-emitting layer (e.g. see column 11, line 40 - c. 12, l. 60 and c. 19, l. 52 - c. 20, l. 61), teach that different light-emitting materials may be mixed in a light-emitting layer in order to control light-emission wavelength and that the mixture may include a phosphorescent material emitting light from a triplet excited state (e.g. see c. 25, l. 36 - c. 27, l. 15), and teach that it is possible to achieve emission of white light from a device comprising multiple light-emitting layers and from a device comprising a mixture of light-emitting materials (e.g. see c. 20, l. 57-61 and c. 26, l. 15-28).

It would have been an obvious modification to one of ordinary skill in the art at the time of the invention to provide light-emitting devices similar to those disclosed by Baldo et al. or Forrest et al. but utilizing different and/or additional light-emitting materials in combination with the iridium complex either in the same layer or in a light-emitting layer separate from the layer comprising the iridium complex. One of ordinary skill in the art would have been motivated to utilize different and/or additional light-emitting materials in combination with the iridium

complex so as to provide a device having the advantages of using a phosphorescent material as taught by Baldo et al. or Forrest et al. while at the same time being able to modify the color of light emitted by the device as taught by Egusa et al. It would have been within the level of ordinary skill of a worker in the art at the time of the invention, as a matter of routine experimentation, to determine suitable and optimum combinations of light-emitting materials selected from known light-emitting materials so as to obtain a functional device capable of emitting light of the color(s) desired.

With respect to claim 12, it would have been an obvious modification to one of ordinary skill in the art at the time of the invention to make devices similar to those taught by Baldo et al. or Forrest et al. but utilizing a transparent substrate made of a material other than glass. One of ordinary skill in the art would have been motivated to select a particular transparent substrate based on suitability for the intended use and based on advantages to be attained by the use of a particular substrate (e.g. based on factors such as cost, availability, durability, and the weight added to a final product by a particular substrate material).

7. Miscellaneous:

In lines 16-17 of claim 8, one occurrence of "tetracarboxylic acid anhydrides of aromatic rings" should be deleted.

In line 4 of claim 10, "includes" should read --include--.

In line 1 of claim 11, the second occurrence of "as" should be deleted.

A period is needed at the end of claim 13.

Art Unit: 1774

8. The prior art made of record and not relied upon is considered pertinent to applicants' disclosure.

Kwong et al. (US 2002/0074935 A1) is an additional reference disclosing a light-emitting device comprising two light-emitting materials in a light-emitting layer wherein one of the light-emitting materials is an orthometallated complex. In particular, see Fig. 5 and Example 2 which begins on page 5.

9. Any inquiry concerning this communication should be directed to Marie R. Yamnitzky at telephone number (703) 308-4413. The examiner works a flexible schedule but can generally be reached at this number from 6:30 a.m. to 4:00 p.m. Monday, Tuesday, Thursday and Friday, and every other Wednesday from 6:30 a.m. to 3:00 p.m.

The current fax numbers for Art Unit 1774 are (703) 872-9311 for official after final faxes and (703) 872-9310 or (703) 305-5408 for all other official faxes. (Unofficial faxes to be sent directly to examiner Yamnitzky can be sent to (703) 872-9041.)

MRY
09/12/02



MARIE YAMNITZKY
PRIMARY EXAMINER

1774